

(d) The connections of the side frame to the roof and underframe shall support the loads specified in this section.

§ 238.419 Truck-to-car-body and truck component attachment.

(a) The ultimate strength of the truck-to-car-body attachment for each unit in a train shall be sufficient to resist without failure a vertical force equivalent to 2g acting on the mass of the truck and a force of 250,000 pounds acting in any horizontal direction on the truck.

(b) Each component of a truck (which include axles, wheels, bearings, the truck-mounted brake system, suspension system components, and any other components attached to the truck by design) shall remain attached to the truck when a force equivalent to 2g acting on the mass of the component is exerted in any direction on that component.

§ 238.421 Glazing.

(a) *General.* Except as provided in paragraphs (b) and (c) of this section, each exterior window on a passenger car and a power car cab shall comply with the requirements contained in part 223 of this chapter.

(b) *Particular end-facing exterior glazing requirements.* Each end-facing exterior window on a passenger car and a power car cab shall also:

(1) Resist the impact of a 12-pound solid steel sphere at the maximum speed at which the vehicle will operate, at an angle of 90 degrees to the window's surface, with no penetration or spall; and

(2) Demonstrate anti-spalling performance by the use of a 0.001 aluminum witness plate, placed 12 inches from the window face during all impact tests. The witness plate shall contain no marks from spalled glazing particles after any impact test.

(3) Be permanently marked, prior to installation, in such a manner that the marking is clearly visible after the material has been installed. The marking shall include:

(i) The words "FRA TYPE IHP" to indicate that the material has successfully passed the testing requirements specified in this paragraph;

(ii) The name of the manufacturer; and

(iii) The type or brand identification of the material.

(c) *Passenger equipment ordered prior to May 12, 1999.* Each exterior window in passenger equipment ordered prior to May 12, 1999 may comply with the following glazing requirements in the alternative of the requirements specified in paragraphs (a) and (b) of this section, until the window is replaced and the railroad has exhausted its inventory of replacement windows conforming to the requirements of this paragraph that it held as of May 12, 1999.

(1) Each end-facing exterior window shall resist the impact of a 12-pound solid steel sphere at the maximum speed at which the vehicle will operate, at an angle equal to the angle between the window's surface as installed and the direction of travel, with no penetration or spall.

(2) Each side-facing exterior window shall resist the impact of a:

(i) 12-pound solid steel sphere at 15 mph, at an angle of 90 degrees to the window's surface, with no penetration or spall; and

(ii) A granite ballast stone weighing a minimum of 0.5 pounds, traveling at 75 mph and impacting at a 90-degree angle to the window's surface, with no penetration or spall.

(3) All exterior windows shall:

(i) Resist a single impact of a 9-mm, 147-grain bullet traveling at an impact velocity of 900 feet per second, with no bullet penetration or spall; and

(ii) Demonstrate anti-spalling performance by the use of a 0.001 aluminum witness plate, placed 12 inches from the window's surface during all impact tests. The witness plate shall contain no marks from spalled glazing particles after any impact test.

(iii) Be permanently marked, prior to installation, in such a manner that the marking is clearly visible after the material has been installed. The marking shall include:

(A) The words "FRA TYPE IH" for end-facing glazing or "FRA TYPE IHH" for side-facing glazing, to indicate that the material has successfully passed the testing requirements of this section;